

4:2:2 Component Digital VTR

# DVR-2100

4:2:2

Component Digital



Sony  
Broadcast

SONY®

*Since the introduction of the world's first D-1 Component Digital VTR, the DVR-1000/DVPC-1000, Sony D-1 VTRs have earned a well deserved reputation for excellence in component digital signal recording. Component digital recording is now playing an increasingly important role in editing, complex picture manipulation and archiving of film based programming by overcoming the performance limitations of analog VTRs.*

*Sony has met the challenge of developing the technologies that are necessary to provide users with even more advanced digital performance and now introduces its second generation D-1 VTRs – the DVR-2100 and 2000.*

*Thanks to a new Dynamic Tracking™ technique, developed exclusively for the D-1 format, the DVR-2100 is capable of broadcast quality playback at speeds over the range of -1 to +2 times normal speed. Furthermore Sony's advanced semi-conductor technology in devices such as VLSI and Gate Array Circuits results in the compact size and light weight of the DVR-2100, which is of single crate construction.*

*To integrate the VTR effectively into component digital systems, component digital I/O ports are fitted to the DVR-2100 as standard. To work in an analog environment, optional video and audio A/D and D/A converters are also available. The DVR-2100 accepts the three sizes of cassettes (S, M and L), with a maximum recording time of 6 minutes for S-size, 34 minutes for M-size and 94 minutes for L-size.*

*To achieve its outstanding operational performance, the DVR-2100 features automatic compensation systems for playback equalization and tracking, while the channel condition can be easily monitored on its control panel.*

*The many advanced technologies and the robust mechanical design of the DVR-2100 offer many benefits in highly creative video production, expanding the range of applications for D-1 VTRs.*



FEATURES

High Quality Variable Speed Playback

Dynamic Tracking Feature

Sony has developed new Dynamic Tracking (DT) heads exclusively for the D-1 format. With these advanced DT heads, the DVR-2100 provides normal speed playback quality at speeds varying between -1 to +2 times, including still and slow motion. In the D-1 tape format, one field requires 10 (525/60 system) or 12 (625/50 system) tracks to achieve high quality component digital recording. This makes the movement range for the DT heads much wider than in conventional Dynamic Tracking. However the DVR-2100 has a new scanner which includes eight DT head tips, arranged in two groups of four. With this new DT technique, every program track can be read during DT playback, without a head having to jump over the tracks. In addition, during normal speed playback, each program track is traced twice by a pair of heads and each output is individually processed by the inner code error correction circuitry. Each pair of error corrected blocks, containing the same recorded information, are then selectively added in a memory to reduce playback dependent errors. As the result, playback error rate is dramatically reduced, contributing to highly reliable playback. With the Dynamic Tracking capability of the DVR-2100, the breadth of application for the D-1 format is significantly increased.

Y/C Add Technique

For best possible Dynamic Tracking playback, the DVR-2100 employs a Y/C Add technique. This technique ensures excellent interpolation of missing fields of information in terms of both luminance (Y) and chrominance (C), to give smooth variable speed playback. In other words, the picture bounce of both luminance and chrominance due to loss of interlace is eliminated. In conjunction with the use of new DT heads, this permits the complete DT playback picture to be reproduced.

State of the Art Electronics

Compact, Lightweight and with Low Power Consumption

Taking full advantages of Sony's innovative semi-conductor technology in VLSI, LSI and Gate Array circuits, the DVR-2100 is compact in size and low in weight, just 8U high and weighing 65 kg (143 lb 5 oz). This advanced technology reduces number of PCB (Printed Circuit Boards) in the DVR-2100 to only ten without compromising its functions, contributing to the low power consumption of 400W. The compact mechanical construction of the DVR-2100 results in it being a single unit VTR – two DVR-2100's can fit in the space of one DVR-1000/DVPC-1000, the current Sony D-1 VTR. Installing DVR-2100's will save space and allow the space conscious design of editing suits and OB (Outside Broadcasting) units.

Model Name	DVR-2100	DVR-1000/ DVPC-1000
Dimensions	8 units high	20 units high*
Weight	65 kg (143 lb 5 oz)	148 kg* (326 lb 4 oz)
Power consumption	400 W	1200 W*

\* These specifications indicate the combined value of the DVPC-1000 processor portion and the DVR-1000 VTR portion.

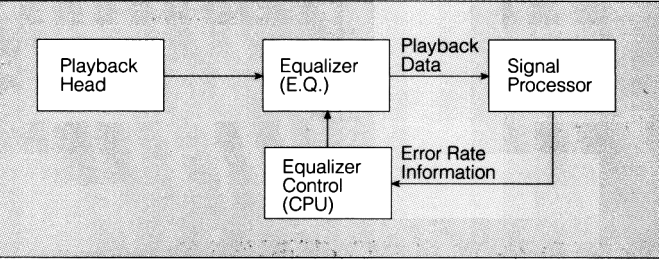
Component Digital Inputs and Outputs As a Standard

Along with the growth in application for the D-1 format, many peripherals equipped with component digital I/O interface have appeared on the market. To effectively integrate the DVR-2100 into component digital systems, it is equipped with digital input and output ports for both video and audio as a standard. For system interfacing, both parallel and serial digital I/O ports are provided for the DVR-2100. The Serial digital interface, which is based upon the SMPTE T 14.224, has the significant advantage of handling component digital video, four channels of digital audio, digital VITC and video index information on a single, low cost coaxial cable. However, when a DVR-2100 is required to work in an analog environment, the BKDV-4224AD/4224DA D-1 Signal Converters and the DAD-A2000 Audio Converter Unit are available as accessories for video and audio AD/DA conversion.

Adjustment-free Operation

Automatic Playback Equalization

To improve its operational performance, the DVR-2100 uses an automatic compensation system for playback equalization. This automatically detects and compensates for playback equalizing errors. RF gain and phase are automatically optimized in playback so that the error rate is minimized. This feature gives reliable and stable playback pictures without continuous manual optimization.



Automatic Equalization Block Diagram

Automatic CTL

The DVR-2100 has an automatic CTL system, eliminating manual optimization of the tracking control in normal playback and over the Dynamic Tracking range of -1 to +2 times normal speed. The automatic CTL system operates by continuously monitoring the off-tape RF level from the Advance heads and feeding a signal back to the capstan servo control system. Along with the automatic equalization system, this feature ensures high quality picture playback at all times.



## Easy Channel Condition Monitoring

### Channel Condition Checking and Logging

The DVR-2100 has the ability to check channel condition during normal playback and confidence playback. Three colored LED's (green, yellow, red) are incorporated in the BKDV-2010 Control Panel to check the channel condition of both video and audio. Each LED indicates the error rate condition, green showing a good channel condition while red indicates a poor channel condition.

When the error rate exceeds a threshold level, its time code data is stored. The result of this channel condition logging can be displayed on the Diagnostics menu.

The channel condition logger system eliminates the need for continuous watching picture monitors while recording or playing back.

### Channel Condition Monitoring

Full details of each channel condition are provided in the EL display of the control panel, with bargraph indication of channel condition. Channel condition either before or after error correction process can be displayed.

These channel condition monitoring and logging features are very effective in evaluating recorded video/audio signals during a recording or on later playback.

The channel condition can also be accessed via the RS-232C port on the DVR-2100, and can be stored in external devices such as microcomputers according to the application software.

## Superior Tape Interchangeability

In the DVR-2100, the CTL record/playback and erasure head is positioned in the lower drum to allow precise servo control and accurate tracking adjustments. This CTL R/P head position allows it to be extremely tolerant to tape speed errors, greatly contributing to improved tape interchange.

A separate stationary CTL head is provided for CTL signal confidence, so that CTL signals can be checked on a waveform monitor during recording.

## Sophisticated Control Panel Operation

All the information required for operation of the DVR-2100 is provided on the large EL display (640 x 200 dots). Operation items are logically categorized into eight main menus. These are easily accessed by using the eight menu keys, with the menu contents displayed on the large EL panel. Set-up or selections are easily made using the 12 function keys located under the EL display. The BKDV-2010 Control Panel for the DVR-2100 is featured below.

- Television system and channel condition can be seen on the control panel at all times.
- Interface information such as video, audio, time code and reference are displayed on the EL panel.
- Cassette size, running direction, remaining tape time and playback speed information is provided on the EL display.



## Built-in Signal Generator

### Internal Test Signal Generator

The DVR-2100 has a built-in test signal generator providing five video test signals (Color Bar 100%, Color Bar 75%, Black, Multi-burst, Serial Digital Interface (SDI) Check Fields) and two audio test signals (1 kHz, 10 kHz), each of which can be selected from a control panel menu. These built-in video/audio test signals are useful for VTR maintenance, system connection examinations or adjustment of external A/D and D/A converters.

### Built-in Time Code Reader/Generator

The DVR-2100 has built-in LTC, ASTC (Audio Sector Time Code) and VITC time code generators and readers. ASTC is a digital time code recorded in spare data bits in the digital audio sectors of the helical tracks. Both VITC (Vertical Interval Time Code) and ASTC can be read, even at slow speeds and still frame, and can also be used for recording/playback of time code related to the source signal, either video or audio. This capability to handle three time codes greatly increases the editing efficiency of the DVR-2100.

## Three Cassette Sizes Accepted

The DVR-2100 is designed to handle all three sizes of cassette – S, M, and L-size. Maximum recording and playback times are 6 minutes for S-size cassette, 34 minutes for M-size cassette, and 94 minutes for L-size cassette. This allows an appropriate cassette size to be selected for different applications.

Model	Size	Tape Thickness	Recording/Playback Time
D1S-6	S	16μm	6 min.
D1M-12	M	16μm	12 min.
D1M-22	M	16μm	22 min.
D1M-34	M	16μm	34 min.
D1L-76	L	16μm	76 min.
D1L-94	L	13μm	94 min.

## Reliable Mechanical Design

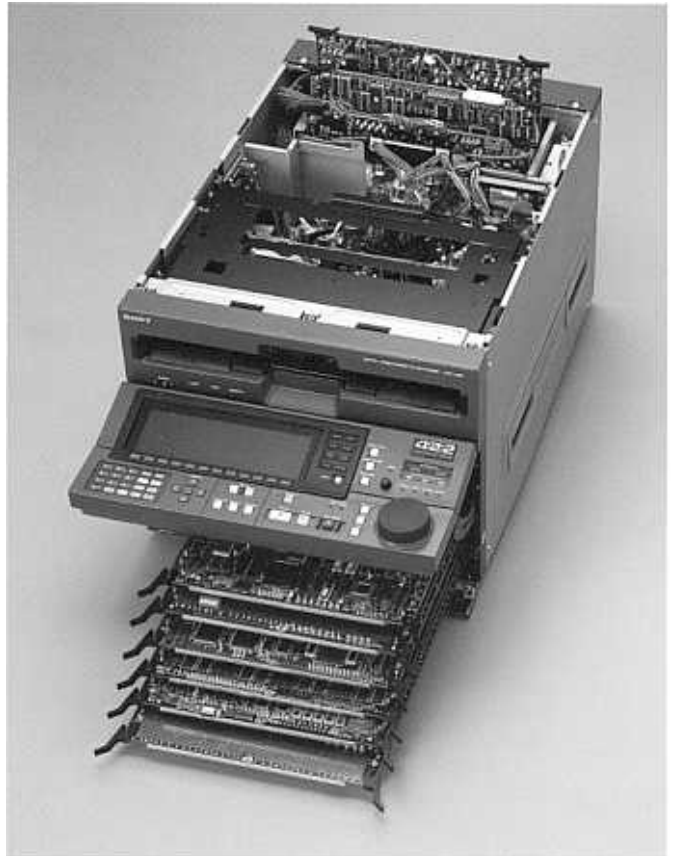
The most critical aspect of a smooth tape path is maintaining correct tape tension. In the DVR-2100, tension regulation arms are provided on both the supply and take-up sides. The additional take-up tension arm not only allows smooth and precise tape tension control, but also greatly improves the response to the “Jog” dial operation. With the adoption of an improved larger diameter capstan, the DVR-2100 offers the wide range of pinch-on mode playback and the response to the jog dial operation is also increased.

The loading mechanism is directly related to the tape tension control. By using an improved supply tension regulation arm, tape tension can be precisely controlled even while the tape is threading. This feature makes possible the short loading time of six seconds for L-size cassette, five seconds for M and S-size cassettes.

## Easy Service and Maintenance

The DVR-2100 is of single unit construction, with all the PCB (Printed Circuits Boards) of the DVR-2100 on plug-in boards for easy servicing with the supplied extension boards. The number of components used in the tape transport area has been drastically reduced for the high reliability and serviceability. The DVR-2100 employs a sophisticated self-diagnostics system to check the condition of the VTR during operation. All the diagnostics information to aid maintenance is provided on the control panel's EL display. A BYPASS Test feature is also incorporated in the DVR-2100 to check whether each board is functioning properly. The DVR-2100 also has built-in video/audio test signal generators which are useful to check boards where a malfunction is suspected.

The control panel attached to the DVR-2100 can be positioned in ten steps and then locked at any of ten positions. Furthermore, the control panel attached to the front panel can be completely removed and connected to the rear panel of the VTR for high servicing.



## Enhanced Applications

### Parallel Operation

The use of a BKDV-4224AD and a BKDV-4224DA D-1 Signal Converter, in conjunction with two DVR-2100's, can form a range of recording/playback systems.

- 4:2:2 picture plus key channel production (4:2:2:4 mode)
- Full band GBR plus key channel production (4 x 4 mode)
- Doubled horizontal resolution of 525/60 or 625/50 signals (8:4:4 H mode)
- Progressive scan 525/60 or 625/50 system (8:4:4 V mode)

These applications will become more widely used in high-end post production houses, where the recording/playback of wide bandwidth key signals is a critical aspect.

The BKDV-4224AD/4224DA can also be used as normal A/D and D/A units for the DVR-2100.

### Film to Tape Transfer

This mode provides improved efficiency in the editing of film material transferred to a DVR-2100 in a 525/60 system.

Once the IN point and field number of the first edit are set, the DVR-2100 will automatically decide the OUT point and field numbers of the edits to follow so that each edit matches the 2-3 pull down sequence. The film to tape transfer of the 625/50 system is carried out in the graphic operation mode without any special conversion requirement.

### Component Signals - From Acquisition to Editing

With the use of Betacam SP™ Camcorder, a BVW-D75/D75P Betacam SP VTR with 4:2:2 Serial Digital Interface and a DVR-2100, a signal can be retained in its component form from acquisition to editing, with no external decoder and encoder units.

### Graphic Operation

This mode simplifies the recording of graphics with a DVR-2100. After each edit, its OUT point is automatically registered as the IN point of the next edit, allowing easy editing of images created with graphic computers or disk based recorders.

### Wider D-1 Applications

The realization of compact and lightweight hardware will provide the DVR-2100 with the probability to be used in the OB (Outside Broadcasting) Van system or the automatic transmission system. This will extend the breadth of application of the D-1 format VTR.





# INTERFACE FACILITIES

## Digital I/O

### Parallel Digital Video Interface

One parallel digital video input port and one parallel digital video output port are provided for the DVR-2100 and these interfaces conform to the SMPTE 125M/EBU Tech 3246 formats. Both digital video and four channels of audio signals can be output via this output port. Digital interfacing with other D-1 VTRs or equipment with a parallel interface is possible via this port. By using an optional digital rate converter (DFX-1200/DFX-1200P/DFX-2100), the DVR-2100 can also be interfaced to D-2 VTRs, such as Sony DVR-20/28/10/18 series, via this port.

### Serial Digital Interface

The DVR-2100 is equipped with one serial input and three serial output ports, each of which carries digital video and four channels of digital audio on a single, low cost coaxial cable. Digital interfacing with other Sony D-1 VTRs and the BVW-D75/D75P Sony Betacam SP VTR is possible via this serial port. This serial form of transmission greatly simplifies system connections, which can now be over long distances. One serial active-through output port is also provided on the DVR-2100 and a signal fed to either serial or parallel input connector can be output via this port.

### AES/EBU Digital Audio Interface

Four serial digital audio I/O ports are provided on the DVR-2100. This interface conforms to the AES/EBU format (48 kHz sampling) and are synchronized with the video signals.

### Monitor Output

The DVR-2100 has three serial and one parallel digital Monitor outputs. Digital video, four channels of audio signals, time code data and VTR status are available from each of these ports.

## Remote

### RS-422A (REMOTE 1, 2 and 3)

The DVR-2100 is equipped with three RS-422A Sony 9-pin remote interface ports for flexible system control. RS-422A equipped Sony VTRs and BVE series editing controllers can be interfaced via these ports.

### RS-232C

One RS-232C serial port is provided to interface with external equipment, such as modems and microcomputers for channel condition monitoring, etc.

### Parallel

The DVR-2100 is equipped with a 50-pin parallel interface port. This parallel port enables the basic functions of the VTR to be controlled from customized remote control units.

### Control Panel

The BKDV-2010 Control panel can be detached from the VTR front panel and interfaced via this connector.

## Reference

### Reference

The DVR-2100 can accept both serial digital and analog black and burst signals (or an analog composite signal) as a reference signal. One serial digital (with active loop-through port) and one analog black and burst connector (with loop-through port) are fitted to the DVR-2100.

### CF Pulse

As component signals decoded from a composite source can be recorded by the DVR-2100, color framing information is necessary for later re-encoding of the signal. Therefore, the DVR-2100 has CF (Color Frame) pulse I/O ports in order to match the encoding and decoding axis. The use of this port extends the use of the DVR-2100's to systems having both component and composite equipment.

## WFM OUT

### Monitor

The MONITOR port provides an output to monitor the RF envelope of digital video and audio signals, or the CTL signals on a waveform monitor. As the DVR-2100 has a CTL confidence head, the CTL signal can be monitored even during recording.

### Trigger

The TRIGGER port enables signals from the MONITOR port to be monitored without supplying an additional reference signal to the waveform monitor.

General	
Power requirements:	AC 100 to 120V/220 to 240V ± 10% selectable, 50/60Hz
Power consumption:	Max. 750 VA
Operating Temperature:	5°C to 40°C (4°F to 104°F)
Humidity (relative humidity):	20 to 80% (non-condensing)
Weight:	65kg (including control panel) (143 lb 5 oz)
Dimensions (w/h/d):	436 × 372 × 682 mm (16 3/4 × 14 × 25") (including control panel and feet)
Recording format:	CCIR Rec. 657 (SMPTE D-1/EBU Tech 3252)
TV standard:	525/60, 625/50 switchable
Tracks:	Video 600 tracks/sec 20 sectors/field (525/60) 24 sectors/field (625/50) Digital audio 600 tracks/sec 40 sectors/field (525/60) 48 sectors/field (625/50) Analog cue 1 track Time code 1 track Control 1 track
Tape speed:	286.588mm/sec. (525/60) 286.875mm/sec. (625/50)
Writing speed (relative speed):	35.63m/sec
Recording time:	6 minutes with Sony (16μm) D1S-6 12 minutes with Sony (16μm) D1M-12 22 minutes with Sony (16μm) D1M-22 34 minutes with Sony (16μm) D1M-34 76 minutes with Sony (16μm) D1L-76 94 minutes with Sony (13μm) D1L-94
Cassette type:	D-1 cassette (L, M or S)
Recommended tape:	Sony high Hc (class 850 Oe) or equivalent
	Within 1 sec (tape transport with frame capstan servo mode from STANDBY ON)
	– 1 to + 2 times normal playback
	± 2 frame (with continuous control track)
Edit accuracy:	0 frame (with time code)
Error correction:	As per standard (Reed-Solomon code)
Error concealment:	
Fast forward/rewind time:	
Load/unload time:	
Video	
Sampling frequency:	Y 13.5 MHz R-Y/B-Y 6.75 MHz
Channel coding:	Scrambled NRZ 8 bits/sample 1 frame (with respect to reference sync)
System timing delay adjustable range:	± 20 horizontal TV lines
Transient response "K" factor (2T pulse):	
Digital audio (Digital audio 1 to 4 channels)	
Quantization:	16-20 bits/sample
Sampling frequency: 48kHz (synchronized with video)	
Wow and flutter: Below measurable level	
Headroom: 20dB	
Audio output delay: 1 frame (with respect to reference sync)	

<b>Inputs/Outputs</b>		
Digital In:	AES/EBU format, XLR-3-31 type (1) — DABK-2002	
Digital Out:	AES/EBU format, XLR-3-32 type (1) — DABK-2001	
Analog In:	+4dBs (+28dBs max.) adjustable range of -4 to +8dBs, 20k ohms or 600 ohms (selectable), balanced, XLR-3-31 type (x 2) — DABK-2001	
Analog Out:	+4dBs (28dBs max.) adjustable range of -4 to +8dBs, less than 60 ohms, balanced, XLR-3-32 type (x 2) — DABK-2002	
Emphasis:	T <sub>1</sub> = 50μ sec./T <sub>2</sub> = 15μ sec. (ON/OFF selectable)	
<b>Analog audio (Cue track)</b>		
Frequency response:	100Hz to 12kHz ± 3dB	
S/N ratio:	Better than 42dB (from 3% distortion)	
Distortion:	Less than 3%	
Wow and flutter:	Less than 0.2%	
Operating level:	+8dBs, 600 ohm load (MIC input: -60dBs)	
<b>Input/Output Connectors and Signals</b>		
AUDIO:	CUE IN	XLR, low impedance/high-impedance selectable, LINE or MIC
	OUT	XLR, low impedance
	MONITOR L/R	XLR, low impedance (DA-1/2/3/4 or cue selectable)
TIME CODE:	IN	XLR, 10k ohms (SMPTE/EBU)
	OUT	XLR, low impedance (SMPTE/EBU)
HEADPHONES:	8 ohms, variable level control	
WFM OUT:	MONITOR: BNC, 75 ohms (RF envelope-A/B/C/D/E/F/G/H or CTL) TRIGGER: BNC, high-impedance (TTL, 150Hz)	
REMOTE:	REMOTE-1	D-sub 9-pin (for RS-422A Sony 9-pin remote interface)
	REMOTE-2	D-sub 9-pin (for RS-422A Sony 9-pin remote interface)
	REMOTE-3	D-sub 9-pin (for RS-422A Sony 9-pin remote interface)
	RS-232C	D-sub 25-pin (for RS-232C interface)
	PARALLEL I/O	D-sub 50-pin (for parallel communica- tion)
	CONTROL PANEL	8-pin (for remote control from BKDV-2010)
VIDEO:	IN	BNC (1): Digital Serial (270 Mb/sec) SMPTE T14.224 (with active through out) D-sub 25-pin (1): Digital Parallel SMPTE 125 M/ EBU Tech 3246-E
	OUT	BNC (3): Digital Serial (270 Mb/sec) SMPTE T14.224 D-sub 25-pin (1): Digital Parallel SMPTE 125 M/ EBU Tech 3246-E
	MONITOR OUT	BNC (3): Digital Serial (270 Mb/sec) SMPTE T14.224 D-sub 25-pin (1): Digital Parallel SMPTE 125 M/ EBU Tech 3246-E
AUDIO:	IN	XLR: AES/EBU format (1 ~ 4CH) (monaural or stereo mode)
	OUT	XLR: AES/EBU format (1 ~ 4CH) (monaural or stereo mode)
	ADVANCE OUT	XLR: AES/EBU format (1 ~ 4CH) (monaural or stereo mode)
REF:	IN	BNC: Digital Serial (270 Mb/sec) SMPTE T14.224 (with active through out) BNC: 75 ohms (composite sync or black burst) (with loop through out)
CF PULSE:	IN	BNC: High impedance (50% duty, TTL, negative edge) (with loop through out)
	OUT	BNC: High impedance (50% duty, TTL, negative edge)

Control panel BKDV-2010 (1), Extension board (EX-244) (1), Extension board (EX-245) (1), Extension board (EX-288) (1), Rack mount fittings (2), AC power cord (1), Metal plate (attached at factory) (1), Operation and maintenance manual (1 set)

design and specifications subject to change without notice.



Optional Accessories and Peripheral Equipment



**BKDV-4224AD**  
D-1 Signal Converter  
(optional video A/D converter unit  
for the DVR-2100/2000)



**BKDV-4224DA**  
D-1 Signal Converter  
(optional video D/A converter unit  
for the DVR-2100/2000)



**DAD-A2000**  
Audio Converter Unit  
(optional audio AD/DA converter  
unit for the DVR-2100/2000)



**BKDV-2010**  
Control Panel for the DVR-2100/2000  
\* Note: One BKDV-2010 is supplied  
with the DVR-2100/2000.



**DFX-1200** (525/60, NTSC)  
Digital Rate Converter  
(D-1 to D-2 format)



**DFX-1200P** (625/50, PAL)  
Digital Rate Converter  
(D-1 to D-2 format)



**DFX-2100** (525/60, NTSC)  
Digital Rate Converter  
(D-2 to D-1 format)



**DDU-2100**  
Digital Audio Delay Unit



**DFX-2400**  
Digital Audio Sampling Rate  
Converter



**BVX-D10**  
Digital Color Corrector



**BVX-100/100P**  
Digital Decoder  
(for analog composite signals)



**BKM-2080**  
Digital 4:2:2 Input Kit  
(parallel and serial)  
(for BVM-1912/1910/1915 series)



**BKM-2085 Series**  
Digital 4:2:2 Input Adaptor Kit  
(serial) (for BVM-1912/1910/1915/  
1310/1315 series)



**PFV-D100/D50**  
Digital Video Interface Unit  
\* Note: Photo shows the PFV-D50.



**DMIF-1000**  
Digital Monitor Interface for PVM-  
1344Q/1444QM/1944Q/2044QM



**VCD-2D/5D/10D/30D**  
(2m, 5m, 10m, 30m)  
Parallel Digital Video Cable:  
D-sub 25-pin



**ECD-3C/10C/30C**  
(3m, 10m, 30m)  
Digital Audio Cable



**RCC-5G/10G/30G**  
(5m, 10m, 30m)  
Remote Control Cable:  
D-sub 9-pin



**D1L-76/94: L-size Cassette**  
(76 min, 94 min)  
Digital Video Cassette  
**D1M-12/22/34: M-size Cassette**  
(12 min, 22 min, 34 min)  
Digital Video Cassette  
**D1S-6: S-size Cassette**  
(6 min)  
Digital Video Cassette



• **D1M-5CL:**  
**M-size Cassette**  
(5 min)  
Cleaning Video Cassette  
• **RMM-18DV**  
Rack Slide Kit

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